ITSD Virtualization

Energy and Cost Savings

Informal Briefing for ITMC, February 3, 2010

POWER / GREEN SAVINGS:

- **In 2006 we were using 276 kilowatts of power on the raised floor. Today we're using 116 kilowatts. That's a reduction of 58%.**

  The data comes from a readout from the UPS on the raised floor. In 2006 this data was pulled by Total Site Solutions to gather data to help build and size our datacenter. Today's data was pulled by Mike Krings with ITSD and was verified by a systems power usage calculation performed by Larry O'Donnell from Cummins Electric. Our latest estimates show that we will utilize 75kW of power once we are in the Helena SMDC thanks to the steps we are continuing to follow below.

  2006 - 276kW
  2009 - 116kW
  2010 SMDC - 75kW

- **This significant reduction in power usage was made possible by the replacement of legacy systems, consolidation of existing systems, and an aggressive virtualization strategy.**

  - **Replacement - We targeted legacy systems and ranked them by their energy efficiency providing us with a list which we used to replace inefficient systems with new, more energy efficient systems.**

    One example of this is the replacement of all of our legacy servers which ran our virtualization environments. We purchased new equipment which slashed our energy usage by a 10:1 ratio and were also able to increase the number of virtual machines running on those systems. The synergy created by increased use of virtualization on this platform combined with the 90% reduction paid for itself immediately. We found many such examples where a simple hardware replacement was shown to pay for itself in energy savings alone in as quickly as a few months.

  - **Consolidation - We targeted systems which provided the same service yet were provided by multiple systems. We also targeted systems which provided a service that was no longer required or whose usage was so low that its existence could no longer be justified. This provided a list which we used to consolidate or eliminate services providing for a much smaller systems and energy usage footprint.**

    One example of this is the consolidation and replacement of our Oracle RAC environment. We identified these systems which were bought to provide a service which was no longer needed, yet the equipment was still powered on and was accruing maintenance charges. We took that equipment and used it to replace much older equipment that was still providing a necessary service. We lowered the energy needed by shrinking the systems we needed and at the same time provided a needed boost to the equipment of a service that was still very much in use.

- **Virtualization - We aggressively mapped out and implemented a plan to virtualize any server which could be virtualized.**

  Since, the end of 2005 when this plan began we have grown from 126 virtual servers to over 500. This is currently resulting in an annual energy savings of 3,942,000 kilowatt-hours. Assuming a commercial power rate of 0.075 per kWh this saves the State roughly $300,000 a year in energy costs alone. We have also saved over $800,000 a year in physical hardware that didn't need to be purchased to provide the services we now provide to the State. All factors taken into account, virtualization currently saves the state over $1,000,000 a year and reduces carbon emissions by almost 5,000,000 lbs.

  Annual Savings from Virtualization
  Energy Savings: $300,000 and 5,000,000 lbs of carbon emissions
  Hardware Purchases: $800,000

VIRTUALIZATION COST SAVINGS

Actually, you can virtualize on the same equipment that you already own. There's really no magic to it and that in a sense is what makes it magical. It's easier to look at an example of an IT shop and work from there.

Part 1 - Looking at Others

Bob's Pretty Good IT Shop - Non Virtualized

Our first IT shop is a small 10 server IT shop. They are currently using small 1 or 2U servers connected to a small iSCSI SAN array. Their needs are met and they're not unhappy with their costs. The costs below are very basic and do not take into account cabling, operating systems, software, and other such needs.

10 servers that cost $6500 each or $65,000 total
1 SAN array that cost $40,000
1 Switch that costs $5,000

Total: $110,000

Bob's Better IT Shop - Virtualized

2 servers (running 10 servers worth of VM's) that cost $6500 each or $13,000 total
1 SAN array that costs $40,000
1 Switch that costs $5,000
vSphere 4 Standard software that costs $800 per processor or $3,200 total

Total: $61,200
Difference: -$48,800

This virtualized shop has not only cut by almost half their systems hardware budget, they have also cut their energy usage by 8 systems or around 450 watts per system for 3600 watts. Additionally, they have dramatically increased the availability of the systems by leveraging vSphere High Availability to provide an uptime that conventional rack mount servers cannot reach.

Part 2 - Looking at Ourselves

So why host with ITSD then? Why doesn't everyone go out and do their own thing? They could, but the environment we have is much much more robust than the one you're seeing above. Let me break it down in much the same way.

ITSD - In a World with No Virtualization

500 servers that cost $6,500 each or $3,250,000 total
1 SAN array that costs $300,000
2 Fiber Channel Directors that cost $250,000
10 Switches that cost $10,000 or $100,000

Total: $3,900,000

ITSD - In the World of Virtualization that We Now Enjoy

25 servers (running 500 servers worth of VM's) that cost $6,500 each or $162,500 total
1 SAN array that costs $300,000
2 Fiber Channel Directors that cost $250,000
10 Switches that cost $10,000 or $100,000
vSphere 4 Enterprise Plus software that costs $3,495 per processor or $174,750 total

Total: $987,250

Difference: -$2,912,750

This is exactly the level of savings virtualization has brought to ITSD and the State as a whole. We have cut our hardware budget by 75% and our energy usage by 475 systems or around 450 watts per system for 213,750 watts. We have also moved these servers to the absolute highest levels of fault tolerance and availability. Using vSphere Enterprise Plus we are able to provide for automated performance based load balancing, enhanced power management, live server migrations where we can migrate systems during the day with no impact to services, and more.

ITSD built this before we needed it. What we have managed to accomplish here is truly extraordinary.